

## A Peculiar Condition of Iron

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upon the peculiarities of this oxide and of nitric acid of the strength required for these experiments; but as a matter of fact it is well known that the oxide produced upon the surface of iron by heat, and showing itself by thin films of various colours, is scarcely touched by nitric acid of the given strength though left in contact with it for days together. That this does not depend upon the film having any great thickness, but upon its peculiar condition, is rendered probable from the fact that iron oxidised by heat, only in that slight degree as to offer no difference to the eye, has been left in nitric acid of the given strength for weeks together without any change. And that this mode of superficial oxidation, or this kind of oxide, may occur in the voltaic cases, is rendered probable by the results of the oxidation of iron in nitrate of silver. When nitrate of silver is fused and common iron dipped into it, so as to be thoroughly wetted, being either alone or in association with platina, the iron does not commence a violent action on the nitrate and throw down silver, but it is gradually oxidised on the surface with exactly the same appearances of colour, uniformity of surface, etc., as if it were slowly oxidised by heat in the air.

Professor Schoenbein has stated the case of iron when acting as the positive electrode of a *couronne des tosses*. If that instrument be in strong action, or if an ordinary battery be used containing from two to ten or more plates, the positive iron instantly becomes covered in the nitric acid with a coat of oxide, which though it does not adhere closely still is not readily dissolved by the acid when the connection with the battery is broken, but remains for many hours on the iron, which itself is in the peculiar inactive state. If the power of the voltaic apparatus be very weak, the coat of oxide on the iron in the nitric acid often assumes a blue tint like that of the oxide formed by heat. A part of the iron is however always dissolved in these cases.

If it be allowed that the surface particles of the iron are associated with oxygen, are in fact oxidised, then all the other actions of it in combination with common iron and other metals

will be consistent; and the cause of its  
platina-like action, of  
its forming a strong voltaic current with  
common iron in the  
first instance, and then being thrown into  
action by it, will be  
explained by considering it as having the  
power of determining  
and disposing of a certain portion of  
hydrogen from the elec-  
trolyte at the first moment and being at  
the same time brought